

## Complete Summary

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### **GUIDELINE TITLE**

Traumatic brain injury: diagnosis, acute management and rehabilitation.

### **BIBLIOGRAPHIC SOURCE(S)**

New Zealand Guidelines Group (NZGG). Traumatic brain injury: diagnosis, acute management and rehabilitation. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2006 Jul. 240 p. [380 references]

### **GUIDELINE STATUS**

This is the current release of the guideline.

### **\*\* REGULATORY ALERT \*\***

### **FDA WARNING/REGULATORY ALERT**

**Note from the National Guideline Clearinghouse:** This guideline references a drug(s) for which important revised regulatory information has been released.

- [May 2, 2007, Antidepressant drugs](#): Update to the existing black box warning on the prescribing information on all antidepressant medications to include warnings about the increased risks of suicidal thinking and behavior in young adults ages 18 to 24 years old during the first one to two months of treatment.

### **COMPLETE SUMMARY CONTENT**

**\*\* REGULATORY ALERT \*\***

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## SCOPE

### **DISEASE/CONDITION(S)**

Traumatic brain injury (due to head injury or post-surgical damage)

### **GUIDELINE CATEGORY**

Diagnosis  
Management  
Rehabilitation  
Risk Assessment

### **CLINICAL SPECIALTY**

Anesthesiology  
Critical Care  
Emergency Medicine  
Family Practice  
Internal Medicine  
Neurological Surgery  
Neurology  
Nursing  
Pediatrics  
Physical Medicine and Rehabilitation  
Psychiatry  
Speech-Language Pathology  
Surgery

### **INTENDED USERS**

Advanced Practice Nurses  
Allied Health Personnel  
Emergency Medical Technicians/Paramedics  
Health Care Providers  
Hospitals  
Nurses  
Occupational Therapists  
Patients  
Physical Therapists  
Physician Assistants  
Physicians  
Psychologists/Non-physician Behavioral Health Clinicians  
Public Health Departments  
Social Workers  
Speech-Language Pathologists  
Utilization Management

### **GUIDELINE OBJECTIVE(S)**

- To provide evidence-based recommendations for best practice in the diagnosis, acute management and rehabilitation of children, young people and adults after traumatic brain injury (TBI)
- To support informed decision-making about acute management, care and rehabilitative approaches by practitioners working with people who have a TBI, their families/whānau and carers

## **TARGET POPULATION**

Children, young people, and adults (including Māori and Pacific peoples) in New Zealand with traumatic brain injury

***These guidelines are not intended for use in the following types of brain injury:***

- Patients with other categories of brain injury, including those resulting from poisoning and anoxia, or stroke and other cardiovascular events
- Patients with prenatal and perinatal brain damage resulting from prenatal and birth-related events

## **INTERVENTIONS AND PRACTICES CONSIDERED**

1. Pre-hospital assessment, management and referral to hospital
2. Management of acute phase of traumatic brain injury (TBI)
  - Emergency department assessments
  - Primary investigations for people with suspected TBI
  - Use of computed tomography and other imaging
  - Use of corticosteroids
  - Transfer from secondary to tertiary care
  - Hospital admission, observation, and discharge
3. Organization of rehabilitation services
4. Rehabilitation following clinically significant TBI (assessment)
5. Rehabilitation following clinically significant TBI (interventions)
  - Physical rehabilitation
  - Optimizing performance in daily tasks
  - Vocational rehabilitation
  - Sexuality, leisure, and recreational rehabilitation
6. Management of persistent symptoms and activity limitation following mild TBI
7. Post-discharge follow-up and support for people with TBI
8. Special considerations in Māori and Pacific peoples with TBI
9. Special considerations for children and young people with TBI
10. Providing for needs of carers and parents of children and young people with TBI
11. Special issues
  - Assessment of capacity and obtaining informed consent
  - Assessment and management of mental health issues
  - Assessment and management of drug and alcohol abuse
  - Assessment of driving abilities
  - Assessment and management of return to play after sporting injuries
  - Assessment of violence or non-accidental injuries

## **MAJOR OUTCOMES CONSIDERED**

- Morbidity or mortality associated with traumatic brain injury
- Incidence of rehospitalization
- Rate of return to employment/school/leisure activities
- Level of functioning, including physical, cognitive, behavioral, and emotional functioning
- Quality of life

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Hand-searches of Published Literature (Secondary Sources)  
Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Guideline topics were operationalised as searchable questions by the New Zealand Guideline Group (NZGG) research team, and a systematic hierarchical search for evidence was conducted. The search strategies for each topic are available in the companion document, *The diagnosis, acute management and rehabilitation of people after traumatic brain injury. Search strategies*. (See "Availability of Companion Documents" field in this summary.) The searches concentrated on finding high grade evidence to answer the identified clinical questions, such as systematic reviews, randomised controlled trials and, where these were not available, observational studies such as well designed cohort and case control studies. Only these types of study design were graded. Where these types of study were not available, less rigorous study designs such as cross-sectional studies and case studies were considered but were not formally graded.

Research identified through the search was assessed for relevance by the NZGG research team, and papers identified as potentially relevant were retained to be included in the critical appraisal process.

A number of recent and rigorously produced 'seed' guidelines and syntheses of relevant evidence to inform the development of this guideline for New Zealand were identified. See the original guideline document for a list of these.

### NUMBER OF SOURCE DOCUMENTS

Not stated

### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

+ Strong study where all or most of the validity criteria are met

~ Fair study where not all the validity criteria are met, but the results of the study are not likely to be influenced by bias

x Weak study where very few of the validity criteria are met and there is a high risk of bias

## **METHODS USED TO ANALYZE THE EVIDENCE**

Review of Published Meta-Analyses  
Systematic Review with Evidence Tables

## **DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE**

Studies were graded using a two-tier system that is detailed in the *Handbook for the Preparation of Explicit Evidence-Based Clinical Practice Guidelines*, published in November 2001 by the New Zealand Guidelines Group (NZGG). This system has been adapted from other grading systems currently in use, in particular the Scottish Intercollegiate Guidelines Network (SIGN) system.

The searches for this guideline concentrated on finding high grade evidence to answer the identified clinical questions, such as systematic reviews, randomised controlled trials and, where these were not available, observational studies such as well designed cohort and case control studies. Only these types of study design were graded. Where these types of study were not available, less rigorous study designs such as cross-sectional studies and case studies were considered but were not formally graded.

The two-tier system follows this process.

1. Critical appraisal of individual relevant studies (identified from the searching) and assigning of **a level of evidence** for the first section of the GATEFRAME checklist that is incorporated into the evidence tables. A random sample of appraisals in the guideline were performed independently by two assessors and the results compared.
2. Joint consensus by the Guideline Development Team on the issues of volume, consistency, clinical relevance and applicability of the body of evidence in the evidence table (filling out the NZGG Considered Judgement form for each clinical question) and the development of **graded recommendations** that attempt to answer the clinical questions posed.

## **METHODS USED TO FORMULATE THE RECOMMENDATIONS**

Expert Consensus

## **DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS**

As part of this guideline project, Accident Compensation Corporation (ACC) commissioned a review of current practice in traumatic brain injury (TBI) rehabilitation from the perspective of TBI providers and consumers. This Current Practice Review was undertaken and completed during 2004, and included a

survey of both TBI providers and TBI consumers (people with TBI and carers) throughout New Zealand. The full report is available as a companion document, *Traumatic brain injury rehabilitation in New Zealand: current practice review*. (See "Availability of Companion Documents" field in this summary.)

The TBI Rehabilitation Guideline Development Team first met in March 2004 to undergo training in the guideline development process, and to determine the main topics and questions to be covered by the guideline. Results of a preliminary literature search (conducted to inform the scope of the guideline) made it apparent that a risk to the effectiveness of any guideline for rehabilitation from TBI would be the impact of treatment recommendations in the acute stage of management. This preliminary literature search also identified a rigorous, evidence-based guideline for care of the acute stage of TBI: *Head Injury: Triage, Assessment Investigation and Early Management of Head Injury in Infants, Children and Adults*, produced by the United Kingdom's (UK) National Institute of Clinical Excellence (NICE) in 2003. ACC agreed that this guideline should be adapted for the New Zealand environment to produce a guideline that would cover the entire process of care and rehabilitation from the point of injury. A sub-group with a focus on the adaptation of the NICE guideline was formed from the main Guideline Development Team, with the addition of clinicians with expertise in emergency medicine and the acute phase of care.

Agreed principles underlying the development of the guideline were:

- A consumer focus – evidence and recommendations should be considered in terms of outcomes that matter to people with TBI, their families/whānau and paid and informal carers
- Consistency with the World Health Organization's International Classification of Functioning, Disability, and Health (ICF)
- Recommendations for diagnostic assessment and rehabilitative interventions should support national consistency in practice
- Aspects of service structure and linkages between sectors and services necessary to support the guideline recommendations should be identified.

It was agreed that for each topic covered by the guideline, consideration would be given to whether the evidence and recommendations would apply equally well to both adults and children, and to Māori and Pacific peoples, and to provide differing recommendations for these populations, where appropriate.

Recommendations were formulated by joint meetings of the multidisciplinary Guideline Development Team. The group considered the entire body of evidence (summarised in the evidence tables) and filled out Considered Judgement forms for each clinical question that was identified as being relevant to the guideline. The following aspects were discussed: volume of evidence, applicability to the New Zealand setting, consistency and clinical impact, with the aim of achieving consensus. Consensus was sought and achieved over the wording of the recommendation and grading.

## **RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS**

**A** - The recommendation is supported by good evidence (where there are a number of studies that are valid, consistent, applicable and clinically relevant).

**B** - The recommendation is supported by fair evidence (based on studies that are valid, but there are some concerns about the volume, consistency, applicability and clinical relevance of the evidence that may cause some uncertainty but are not likely to be overturned by other evidence).

**C** - The recommendation is supported by international expert opinion

**GPP** - Where no evidence is available, best practice recommendations are made based on the experience of the Guideline Development Team, or feedback from consultation within New Zealand.

## **COST ANALYSIS**

The guideline developer reviewed published cost analyses.

## **METHOD OF GUIDELINE VALIDATION**

External Peer Review  
Internal Peer Review

## **DESCRIPTION OF METHOD OF GUIDELINE VALIDATION**

A draft of this guideline was widely circulated to more than 250 individuals/organisations for comment in June 2005 as part of the peer review process.

# **RECOMMENDATIONS**

## **MAJOR RECOMMENDATIONS**

Definitions for the Levels of Evidence and Grades of Recommendation (**A-C** and **Good Practice Points [GPP]**) are given at the end of the "Major Recommendations" field. Where no evidence is available, best practice recommendations are made based on the experience of the Guideline Development Team.

### **Pre-Hospital Assessment, Management and Referral to Hospital**

#### **Pre-Hospital Assessment - Acute**

**C** - A person with a suspected traumatic brain injury should initially be assessed and managed according to clear principles and standard practice as embodied in the Advanced Trauma Life Support (ATLS)/Early Management of Severe Trauma (EMST) system and for children the Advanced Paediatric Life Support (APLS) system.

**C** - The first priority for those administering immediate care is to treat the greatest threat to life and avoid further harm.

**C** - A person who has sustained a suspected traumatic brain injury should have full cervical spine immobilisation attempted, unless they have all of the following:

- No alteration of consciousness
- No neck pain/tenderness
- No focal neurological deficit
- No major distracting injury

**C** - A person who has sustained a suspected traumatic brain injury should be transported directly to a centre where traumatic brain injury is managed in entirety.

Where this type of facility is unavailable, the person should be transported to a centre that can stabilise the person's condition prior to transfer to a centre where traumatic brain injury is managed in entirety.

It is expected that all acute hospitals accepting people who have sustained a suspected traumatic brain injury should have the resources to expeditiously assess and intervene to optimise outcome and that these resources should be appropriate for the person's age.

**C** - Paramedics should be fully trained in the use of the adult and paediatric versions of the Glasgow Coma Scale and its derived score.

**C** - Paramedics should have training in the detection of non-accidental injury and should pass this information to Emergency Department personnel when the relevant signs and symptoms arise.

### **Assessment of Need for Medical Attention**

#### *Glasgow Coma Scale*

**C** - The adult and paediatric versions of the Glasgow Coma Scale should be used to assess people with a head injury.

**GPP** - A fall in the Glasgow Coma Scale score of two or more points, no matter what the original score, requires urgent investigation and/or referral.

#### *Loss of Consciousness*

**C** - Any loss of, or alteration in, consciousness should be recorded and assessed in people with a suspected traumatic brain injury.

**GPP** - People with altered consciousness should have their blood glucose levels checked routinely as part of their assessments.

#### *Post-traumatic Amnesia*

**C** - Post-traumatic amnesia should be prospectively assessed and recorded when assessing people with a suspected traumatic brain injury, where possible.



**GPP** - Services assessing people with traumatic brain injury should choose one of the available validated post-traumatic amnesia measurement tools and ensure all staff are familiar with its use.

#### *Neurological Signs*

**C** - Neurological signs should be assessed and recorded when assessing people with a suspected traumatic brain injury.

#### *Bleeding Disorders and Use of Anticoagulants*

**C** - Coagulopathy and the use of anticoagulant medication, or medications and supplements with anticoagulant effect, should be considered when assessing people with a suspected traumatic brain injury.

#### *Headache*

**GPP** - Strong analgesia for headache should be avoided, if possible, until a full assessment has been made in the Emergency Department.

### **Organisation of Trauma Services**

**C** - Each District Health Board in New Zealand should develop a plan for maximising the coordination of its trauma services to ensure the best possible care for people with severe traumatic brain injury, including timely referral to services provided by other District Health Boards.

**C** - A system and appropriate protocols for alerting the destination Emergency Department should be developed for all hospitals managing suspected traumatic brain injury.

### **Acute Phase of Traumatic Brain Injury Care**

#### **Emergency Department Assessment of People with a Suspected Traumatic Brain Injury**

**C** - Emergency Department assessments of people with suspected traumatic brain injury should focus on the identification of actual or potential hypotension and/or hypoxia, clinically significant brain injuries and appropriate referral for imaging.

**C** - Co-existing injuries and other concerns, such as possible non-accidental injury or nontraumatic aetiology, should also receive attention.

**C** - Imaging (for those meeting selection criteria) should be done early, in preference to admission and observation for neurological deterioration.

**C** - Data to enable decisions to be made about the probability of traumatic brain injury and the necessity of referring for a computed tomography (CT) scan should be collected on admission by a health care practitioner appropriately trained in emergency medicine.

**GPP** - The priority for all people attending an Emergency Department is the stabilisation of airways, breathing and circulation (ABC) before attention to other injuries.

**GPP** - Anyone presenting to an Emergency Department with a suspected traumatic brain injury should receive a triage assessment by a trained staff member on arrival. Part of this triage assessment should establish whether they are high or low risk for clinically significant brain injury and/or cervical spine injury, using the CT rules in this guideline.

**GPP** - Anyone presenting to an Emergency Department with impaired consciousness (Glasgow Coma Scale score of less than 15) should be assessed immediately by a trained staff member (such as a triage nurse).

**GPP** - In people with a Glasgow Coma Scale score of 8 or less, there should be early involvement of an anaesthetist, emergency physician or critical care physician to provide appropriate airway management and assist with resuscitation.

**GPP** - Anyone found to be high risk on triage for clinically significant traumatic brain injury should be assessed within 10 minutes by a health care practitioner with experience in the assessment of such people.

Anyone assessed, on initial triage, as being at low risk for clinically significant traumatic brain injury should be reassessed within a further hour by a doctor with appropriate experience. Junior doctors rostered to the Emergency Department should have training in the assessment of people with traumatic brain injury, and clear protocols detailing when to seek more senior assistance.

**GPP** - Assessment should establish the need to request CT imaging of the head. All Emergency Department health care practitioners involved in the assessment of people with suspected traumatic brain injury should be competent in assessing the presence or absence of risk factors used to select adults, infants and children appropriately for CT imaging. Training should be provided to ensure that this is the case.

**GPP** - In general, people with a suspected traumatic brain injury should not receive strong systemic analgesia until they have been fully assessed, so that an accurate measure can be made of consciousness and other neurological signs. Local anaesthetic should be delivered for fractured limbs or other painful injuries.

**GPP** - Throughout the hospital episode, all care professionals should use a standard 'suspected traumatic brain injury' proforma in their documentation when assessing and observing people with suspected traumatic brain injury.

### *Alcohol*

**C** - Airways, breathing and circulation (ABC) should be stabilised before attention to other injuries.

**C** - Signs of possible traumatic brain injury should not be attributed to alcohol intoxication alone when assessing people with traumatic brain injury.

**C** - Blood alcohol levels should be tested and results recorded for all people with suspected traumatic brain injury and a Glasgow Coma Scale score of less than 15 and/or where alcohol intoxication is suspected.

**C** - People who present with a suspected traumatic brain injury who are intoxicated following drug or alcohol use should have this recorded as part of their assessment.

### **Primary Investigation for People with a Suspected Traumatic Brain Injury**

**C** - The diagnosis of intracranial haemorrhage should not be ruled out on the basis of negative skull X-rays.

**A** - The primary investigation of choice for the detection of clinically significant acute complications of traumatic brain injury is CT imaging of the head.

**C** - Skull X-rays may be requested as part of skeletal surveys for the detection of non-accidental injury in children and in addition to a CT scan.

**C** - Skull X-rays in conjunction with high-quality inpatient observation have a role where CT scanning resources are unavailable.

#### *Selection of Adults for CT Imaging of the Head*

**B** - CT scans should be immediately requested for adults who have sustained a head injury, if they have any one of the following risk factors:

- Any deterioration in condition
- A Glasgow Coma Scale score of less than 13 when assessed, irrespective of the time elapsed since the injury
- A Glasgow Coma Scale score of 13 or 14 two hours after the injury
- A suspected open or depressed skull fracture
- Any sign of basal skull fracture (haemotympanum, 'panda' eyes, cerebrospinal fluid otorrhoea, Battle's sign)
- Post-traumatic seizure
- Focal neurological deficit
- More than one episode of vomiting
- Amnesia for more than 30 minutes for events before the injury.

**B** - CT scanning should be immediately requested for adults with any of the following risk factors who have experienced an injury to the head with some loss of consciousness or amnesia since the injury:

- Age 65 years or older
- Coagulopathy (history of bleeding, clotting disorder, current treatment with warfarin)

- High-risk mechanism of injury (a pedestrian struck by a motor vehicle, an occupant ejected from a motor vehicle, or a fall from a height of greater than one metre or five stairs)

### **Imaging of People with a Suspected Traumatic Brain Injury**

**GPP** - All CT scans of the head should be reviewed by a clinician who has been deemed competent to review such images.

**GPP** - A full or interim written report for the person's notes should be provided within an hour of all imaging procedures performed on people with head injury.

**GPP** - Neurosurgical or anaesthetic referral for people with severe head injury should not be delayed for imaging of any kind.

### **Use of Corticosteroids in Acute Traumatic Brain Injury**

**A** - Avoid corticosteroids in the management of people with acute traumatic brain injury of any severity.

### **Transfer From Secondary to Tertiary Care Settings**

**C** - There should be designated consultants in both the referring hospital and the tertiary care facility (generally a neurosurgical unit but may be an adult or paediatric intensive care unit) with responsibility for the transfer and receipt of people (adults and children) with suspected traumatic brain injury.

**C** - Local guidelines, consistent with national guidelines, on the transfer of people with suspected traumatic brain injury, including the transfer of the responsibility for care, should be drawn up between the referring hospital and the tertiary care facility.

**C** - Resuscitation and stabilisation of the injured person should be completed before transfer. A person persistently hypotensive despite resuscitation should not be transported until stabilised.

**C** - All people requiring transfer to tertiary care with Glasgow Coma Scale scores of 8 or less should be intubated and ventilated.

**C** - A person with suspected traumatic brain injury should be accompanied by a doctor with at least two years' experience in an appropriate specialty, who should:

- Be familiar with the pathophysiology of traumatic brain injury, drugs, equipment and working in the ambulance or helicopter
- Have received specialist training in the transfer of people with traumatic brain injury
- Have an adequately trained assistant
- Be provided with appropriate clothing and medical indemnity and personal insurance

**C** - The transfer of a child or infant to a tertiary care facility should be undertaken by staff experienced in the transfer of critically ill children.

**C** - The transfer team should have a means of communication with their base hospital and the tertiary care facility during the transfer.

**C** - Appropriate resources for education, training and audit should be provided.

**C** - Indications for intubation and ventilation in people with traumatic brain injury: **immediately**.

- Coma (Glasgow Coma Scale score of 8 or less)
- Loss of protective laryngeal reflexes
- Ventilatory insufficiency:
  - Hypoxaemia ( $\text{PaO}_2$  less than 65 mm Hg on air or less than 95 mm Hg on oxygen) or
  - Hypercarbia ( $\text{PaCO}_2$  greater than 45 mm Hg)
- Spontaneous hyperventilation causing  $\text{PaCO}_2$  less than 30 mm Hg
- Respiratory arrhythmia

**C** - Indications for intubation and ventilation in people with traumatic brain injury: **before the journey**.

- Significantly deteriorating conscious level, even if not coma
- Bilateral fractured mandible
- Copious bleeding into mouth
- Seizures

**C** - Carers and family/whānau should have as much access to the injured person during transfer as is practical.

**C** - Carers and family/whānau should be fully informed about the transfer.

**C** - Service provision in the area of paediatric transfer to tertiary care should also follow these principles.

### **Indications for Hospital Admission**

**C** - Criteria for admission to hospital following traumatic brain injury:

- A deteriorating Glasgow Coma Scale score
- A clinically significant abnormalities on imaging
- A Glasgow Coma Scale score of less than 15 after imaging
- When criteria for CT scanning are met but it is not possible
- Focal or abnormal neurological signs
- Early post-traumatic seizure
- Skull fracture
- A major force of injury
- Continuing signs of concern to the clinician (e.g., vomiting, severe headaches, amnesia)

- Other reasons for clinician concern (e.g., drug or alcohol intoxication, other injuries, shock, suspected non-accidental injury, meningism, cerebrospinal fluid leak, where a scalp laceration overlies a fracture, or due to the injured person's age)
- When there is no responsible family member, caregiver or close friend under whose care the person could be discharged
- 'Mild' head injuries with symptoms such as headache, photophobia, nausea and vomiting, or amnesia requiring management

**C** - People who require an extended period in a recovery setting due to the use of sedation or general anaesthetic during CT imaging should not normally require admission.

**C** - Resuscitation and stabilisation of the injured person should be completed before transfer. A person persistently hypotensive despite resuscitation should not be transported until stabilised.

**C** - People with multiple injuries should be admitted under the care of the team appropriate to their most severe and urgent problem.

### **In-Hospital Observation of People with Traumatic Brain Injury**

#### *Observation: General*

**C** - In-hospital observation, including all Emergency Department observation, of a person with traumatic brain injury should be conducted only by health care practitioners competent in the assessment of traumatic brain injury.

**C** - Observation of infants and young children with traumatic brain injury should only be performed by units (including normal paediatric observation settings) with staff trained and experienced in their observation.

#### *Type and Frequency of Observation*

**C** - Minimum documented neurological observations should be:

- Glasgow Coma Scale score
- Pupil size and reactivity
- Limb movements
- Respiratory rate
- Heart rate
- Blood pressure
- Temperature

**C** - Observations should be performed and recorded every 15 minutes, or more frequently in some cases, until the person has achieved a Glasgow Coma Scale score of 15 on two consecutive occasions.

**C** - For people with an initial Glasgow Coma Scale score of 15, or who have returned to a Glasgow Coma Scale of 15 on two consecutive observations, the minimum frequency of observations following the initial assessment should be:

- Half hourly for the first two hours, **then**
- One hourly for four hours, **then**
- Two hourly thereafter

#### *Need for Reassessment/Other Action*

**C** - If a person with a Glasgow Coma Scale score of 15 deteriorates at any time after the initial two-hour period, observations should revert to every 15 minutes or more frequently if necessary and follow the original frequency schedule.

**C** - An urgent reappraisal should be done by the supervising doctor if any of the following signs of neurological deterioration occur:

- Development of agitation or abnormal behaviour
- A sustained (i.e.,  $\geq 30$  minutes) drop of one point in the Glasgow Coma Scale score
- Any drop of more than two points in the Glasgow Coma Scale score
- Development of severe/increasing headache or persisting vomiting
- New or evolving neurological symptoms or signs

**C** - An immediate CT scan should be considered if any of the above signs of neurological deterioration occur.

**C** - Further CT or magnetic resonance imaging (MRI) scanning should be considered in the case of a person who has had a normal CT scan but who has not achieved a Glasgow Coma Scale score of 15 after 24 hours' observation.

#### *Type and Frequency of Observations*

**GPP** - Post-traumatic amnesia and focal neurological signs should be assessed at regular intervals.

#### **Discharge From Hospital**

**C** - A person with suspected traumatic brain injury may be discharged if:

- The person has a Glasgow Coma Scale score of 15 (or in children, normal consciousness as assessed by the paediatric version of the Glasgow Coma Scale) and CT is not indicated

or

- Head or cervical spine imaging is normal and the person has returned to a Glasgow Coma Scale score of 15 (or in children, normal consciousness as assessed by the paediatric version of the Glasgow Coma Scale)

and

- No other factors are present that would warrant a hospital admission
- There are appropriate support structures for safe transfer and subsequent care and supervision

**C** - People with suspected traumatic brain injury who have been admitted to hospital may be discharged to the community if:

- There is resolution of all significant symptoms and signs
- There are appropriate support structures for their safe transfer and subsequent care and supervision

**C** - Infants or children presenting with suspected traumatic brain injury who require imaging of the head or cervical spine should not be discharged until assessed by a clinician experienced in the detection of non-accidental injury.

**C** - All personnel involved in the triage and assessment of infants and children with suspected traumatic brain injury should have training in the detection of non-accidental injury.

**C** - All people with any degree of suspected traumatic brain injury who are discharged should receive verbal advice which:

- Outlines the risk factors in their community setting
- Explains that some people make a quick recovery, but may later experience complications
- Gives instructions on contacting community services in the event of delayed complications

**C** - People who initially presented with drug or alcohol intoxication and are being discharged should receive information and advice on alcohol or drug misuse.

**C** - People with any degree of suspected traumatic brain injury with no carer at home should be discharged only when there is negligible risk of late complications, or when suitable supervision arrangements have been organised.

**B** - People with mild traumatic brain injury may be advised in their discharge information that bed rest may temporarily help alleviate excessive dizziness, but will not aid recovery.

**GPP** - People discharged from hospital after a traumatic brain injury should have had their general practitioner notified either before or at the point of discharge, with details of any residual impairments and details of the planned follow-up.

**GPP** - People who are discharged after a suspected traumatic brain injury sustained after a self-harm or suicide attempt should have a risk assessment performed and should be referred as appropriate.

## **Rehabilitation Services**

### **Organisation of Services**

#### *Coordination and Communication*

#### Case Coordination



**B** - People with traumatic brain injury who require rehabilitation should have a case coordinator/key worker appointed.

**B** - A paediatric case coordinator/key worker should be appointed for children and young people with traumatic brain injury.

**B** - The case coordinator/key worker should:

- Be focused on the needs of the person with traumatic brain injury and their carer(s)
- Have specialist training
- Provide continuity and good communication
- Be the key point of contact

**GPP** - Any change of case coordinator or Accident Compensation Corporation (ACC) case manager should be immediately advised to the person with traumatic brain injury and their carer(s).

### **Rehabilitation Teams**

**C** - Common goals of the team should be consumer centred

**C** - The assessment and planning of rehabilitation should be by a coordinated, multidisciplinary team taking an interdisciplinary approach.

**C** - Teams should have clear, skilled leadership and efficient coordination.

**C** - The case coordinator should be central to deciding which other disciplines need to be involved in the planning and delivery of rehabilitation.

**B** - All health care practitioners working with people following a traumatic brain injury need to have had specialist training in the application of their disciplines to neurological conditions.

### **Rehabilitation Following Clinically Significant Traumatic Brain Injury - Assessment**

**C** - People who have had a traumatic brain injury should be assessed for functional deficits in activities of daily living and be assessed for specific impairments in:

- Control over bowels and bladder
- Speech and swallowing
- Motor control
- Sensory function
- Language production and comprehension
- Cognition and memory
- Behaviour and emotion
- Potential medical and psychiatric comorbidities, which have symptomatic overlap with traumatic brain injury

**C** - All people with traumatic brain injury should be considered for referral for a neuropsychological assessment to evaluate cognitive functioning.

**C** - Assessment should include seeking information from family/whānau and carers who knew the person before their injury and who are caring for the person post-injury.

**C** - Staff assessing people with traumatic brain injury should have training and expertise in the application of their disciplines to people with neurological disorders.

**C** - Staff assessing children and young people with traumatic brain injury should have general paediatric training and specific expertise in the application of their disciplines to children with neurological disorders.

**GPP** - An assessment of the Glasgow Coma Scale for the purpose of estimating the severity of traumatic brain injury should be made from 30 minutes after the injury.

**GPP** - The primary focus of assessment should be on the person's participation goals, and an assessment of activity limitation and impairments should be made within this context.

**GPP** - A speech-language therapist should lead communicative and dysphagia assessments.

**GPP** - A neuropsychologist should lead a cognitive and behavioural assessment.

**GPP** - Rehabilitation teams should have access to suitable health care practitioners to provide consultative services, education and oversight, especially when particular health care practitioners are unavailable to be members of a team.

## **Rehabilitation Following Clinically Significant Traumatic Brain Injury - Intervention**

### **Physical Rehabilitation**

**C** - A physiotherapist or occupational therapist with neurological expertise should coordinate physical therapy to improve the motor function of people with traumatic brain injury.

**C** - Any physical treatment approaches should take account of any associated orthopaedic or musculoskeletal injuries.

**C** - The physical rehabilitation programme should include a written and illustrated plan for other members of the team, including family/whānau and carers.

**C** - A speech-language therapist with dysphagia expertise should coordinate the dysphagia therapy.

**GPP** - Any programmes should be adapted to accommodate the person's normal environment and activities as far as possible.

#### *Motor Control and Function*

**C** - People with traumatic brain injury who are unable to maintain their own sitting balance should have timely provision of an appropriate wheelchair and suitable supportive seating package, with regular review of the seating system as their needs change.

**C** - Age-appropriate supportive seating and wheelchairs should be provided for children and young people.

**C** - People with complex postural needs should be referred to a specialist interdisciplinary team which includes expertise in specialist seating.

**C** - People with mobility problems should be considered for appropriate walking or standing aids.

**C** - Orthoses should be individually fitted.

**B** - The following should be considered as an adjunct to conventional therapy:

- Treadmill training with partial bodyweight support
- Strength training
- Gait re-education
- Exercise training

**C** - A carefully monitored and evaluated trial of botulinum toxin A (BTX-A) for the treatment of focal spasticity in adults with traumatic brain injury may be considered.

**C** - A carefully monitored and evaluated trial of BTX-A for the treatment of focal spasticity in children with traumatic brain injury may be considered, with awareness that a longer-term treatment may be necessary before any benefits are found.

**C** - A trial of intrathecal baclofen for the treatment of severe spasticity in adults or children with traumatic brain injury may be considered, but should be carefully monitored for possible complications, including pump malfunction.

**C** - A carefully monitored and evaluated trial of tizanidine may be considered, particularly for spasticity of the lower extremities.

**GPP** - Any rehabilitation programme should include a flexibility routine when there is any spasticity.

#### *Continence*

**C** - People with continence problems should not be discharged from residential care until continence aids and services have been arranged at home and carer(s) have been adequately prepared.

**C** - A plan for the rehabilitation of urinary incontinence should include:

- A regular monitoring programme
- Strategies for alerting the carer(s) to the person's need to pass urine where there are communication problems
- A toileting regimen based on reinforcement in cases of cognitive impairment.

**C** - Anticholinergic medication should only be prescribed after demonstration of an overactive bladder.

**C** - Intermittent catheterisation should be considered in adults with a postmicturition residual volume of >150 ml.

**C** - Long-term catheters, if necessary, should be used as part of a planned catheter management programme using an agreed protocol.

**C** - The impact of long-term catheters, particularly indwelling urethral catheters, on sexual function should be considered.

**C** - Supra-pubic catheters should be used in preference to long-term urethral catheters.

**C** - In the case of constipation, an active bowel management regimen should be instituted as soon as possible, which includes:

- Ensuring sufficient fluid intake
- The use of natural laxatives or simple bulk laxatives
- Exercise and standing, where possible
- Avoiding medications which slow gut motility
- Maximum privacy and comfort during defecation
- Supported sitting up for defecation at the earliest safe opportunity, and at a regular time each day

**C** - Where the rectum is full but no spontaneous evacuation occurs, daily rectal stimulation may be used.

**C** - If the rectum is empty for three days running despite continuing oral intake, the use of an osmotic laxative or a stimulant should be considered.

**GPP** - Bladder and bowel management plans should be developed with the full knowledge and support and help of the person's primary carer.

**GPP** - Intermittent catheterisation should be considered in children with a postmicturition residual volume of >10% of bladder capacity.

### *Sensory Impairment*

**C** - People with visual and/or hearing loss should be assessed and treated by a team with the appropriate experience or in conjunction with a specialist service.

**A** - People with traumatic brain injury with any visual disturbance should be assessed by a team which includes:

- Ophthalmologists
- Orthoptists where there are problems with eye movement/double vision
- People with expertise in rehabilitation for the visually impaired

**A** - All people presenting post-traumatic brain injury with persistent visual neglect or field defects should be offered specific retraining strategies.

**B** - All people should be assessed for pain on a regular basis and treated actively in accordance with their wishes.

**C** - Practitioners should be alert to the possibility of pain in people who have difficulty communicating, and pay attention to non-verbal signs of pain.

**B** - Practitioners and carers should be educated about:

- Hypersensitivity and neurogenic pain
- Appropriate handling of the paretic upper limb during transfers

Pain management protocols should be in place, which include:

- Handling, support and pain relief appropriate to the individual needs of the injured person **(B)**
- Regular review and adjustment to changing need **(C)**

#### *Communication and Language Rehabilitation*

**B** - A person with traumatic brain injury who has specific communication difficulties should be assessed by a speech-language therapist for suitability for speech-language therapy.

**A** - A person with traumatic brain injury who has specific communication difficulties where achievable goals are identified, should be offered an appropriate treatment programme, with monitoring of progress.

A communication rehabilitation programme should:

- Take into account the person's premorbid communication style and any cognitive deficits **(C)**
- Provide the opportunity to rehearse communication skills in naturalistic situations **(C)**
- Include the family/whānau and carer(s) in developing strategies for optimum communication **(C)**
- Include communication aids where appropriate **(B)**

**GPP** - A communication rehabilitation programme should provide compensatory strategies.

### Children and Young People

**GPP** - Assessment and intervention for communication deficits in children should be appropriate to their age and development.

**GPP** - Assessments and the development of communication rehabilitative strategies for children and young people should be done by paediatric speech-language therapists with expertise in traumatic brain injury.

### *Cognitive Rehabilitation*

**C** - Where cognitive impairment is causing management difficulties or limiting the response to rehabilitation, specialist advice should be sought.

**B** - People with persistent cognitive deficits following traumatic brain injury should be offered functionally oriented cognitive rehabilitation.

Cognitive rehabilitation should include:

- In the acute phase, management in a structured and distraction-free environment and targeted programmes for those with executive difficulties **(A)**
- Attempts to improve attention and information-processing skills **(B)**
- Teaching compensatory techniques **(C)**
- The use of external memory aids **(A)**

**B** - Trial-and-error learning should be avoided in people with memory impairment.

**C** - A trial of methylphenidate may be considered for adults or children with traumatic brain injury who have deficits in the speed of mental processing or attention deficit hyperactivity disorder secondary to traumatic brain injury.

**C** - A trial of donepezil hydrochloride may be considered for adults with traumatic brain injury who have deficits in memory and sustained attention.

**GPP** - Cognitive rehabilitation should include procedural learning information and principles.

**GPP** - Any trial of medication for people with traumatic brain injury should be commenced at low doses, with cautious increases in dosage, and be monitored for effectiveness and adverse side effects.

**GPP** - Any trial of medication for a person with traumatic brain injury should be preceded by a clear explanation to the person with traumatic brain injury and their carer(s), and a caution that effects of medications are less predictable in people with traumatic brain injury.

### *Psychosocial/Behavioural Rehabilitation*

**C** - People with traumatic brain injury should be provided with access to specialist psychological assessments and interventions to assist in the management of their behavioural difficulties, including substance abuse.

**C** - People with severe behavioural problems, especially those with a tendency to wander, should be referred to specialist behavioural management services.

**C** - When there is severe behavioural disturbance, supervision and behavioural management by a professional trained in behavioural management should be provided.

**C** - In the case of people with severe behavioural problems, especially those with a tendency to wander, the interdisciplinary team should develop an integrated approach to manage behaviour and refer to specialist behavioural management services when necessary.

**C** - Families/Whānau and carers should be given information and ongoing support as required to help them to understand cognitive and behavioural problems, and guidance on how to interact appropriately with the person with traumatic brain injury and how to access services.

**C** - Psychotropic medications used to manage agitation and aggression in people who have had a traumatic brain injury should be carefully selected for their side effect profiles, and the use and effectiveness closely monitored.

**C** - If no effect is observed within six weeks, the drug should be 'tailed off' and another drug trialled after a suitable wash-out period.

**GPP** - Treating clinicians should ask about the use of any non-prescription medicines, supplements and complementary or alternative medicines.

**GPP** - When necessary, an assessment by a neuropsychiatrist should be made to differentiate neurobehavioural difficulties from symptoms of a functional illness.

**GPP** - A person with traumatic brain injury who may require medication for irritability and aggression should be referred to a neuropsychiatrist for treatment.

## **Optimising Performance in Daily Living Tasks**

### *Daily Living Skills*

**C** - All daily living tasks should be practised in the most realistic and appropriate environment, with the opportunity to practise skills outside therapy sessions.

**C** - An individual treatment programme aimed at maximising independence in the areas of self maintenance, productivity and leisure should be developed and implemented.

**C** - Family and carers should be involved in establishing the most appropriate routines for activities of daily living for people with traumatic brain injury, which take account of their lifestyles and choices.

**C** - All people with traumatic brain injury who have difficulties in activities of daily living should be assessed by an occupational therapist, nurse or other health care practitioner with expertise in brain injury and experience in this area.

**C** - Services should recognise that the provision of 'care' for some people with traumatic brain injury may mean the supervision and practice of community living skills, rather than hands-on physical care.

#### *Equipment and Technology*

**C** - People with traumatic brain injury who have difficulties in functioning should be assessed by people with expertise in this area, to determine whether equipment or adaptations could increase their safety or independence.

**C** - The need for equipment should be assessed on an individual basis and in the environment in which it will be used.

**C** - The prescription of equipment should take account of any cognitive and behavioural deficits and their constraints on the person's ability, or their carer's ability, to use the equipment safely and appropriately. Where this is in doubt, arrangements should be in place for regular review.

**C** - When an item of equipment has been identified as required for a person with traumatic brain injury, it should be provided as quickly as possible and before the person is discharged to the community.

**C** - The person, their family/whānau or carer(s) should be trained in the safe and effective use of equipment.

**C** - The ongoing effectiveness of equipment should be reviewed on a regular basis and in accordance with the manufacturers' guidelines.

**C** - People and their families/whānau and carers should be given clear written information on who to contact for repairs, replacement or future help and advice regarding the equipment.

**C** - Where necessary, a specialist assessment of each individual's ability to use a personal computer should be arranged and the need for adapted hard- and software recorded.

**C** - Rehabilitation teams should consider computers and other technology as adaptive sources of meaningful occupation or as compensatory strategies for people with significant sequelae of brain injury.

#### *Daily Living Skills*

**GPP** - Carers and family, if willing and acceptable to the person with traumatic brain injury, should be trained and supported to help with therapy.

#### *Equipment and Technology*



**GPP** - People with traumatic brain injury should be given information and advice about changes in technology and computer use relevant to their needs.

**GPP** - The assessment for, and prescription of, augmentative communication devices should be made by suitably accredited clinicians.

**GPP** - Careful consideration should be given to the appropriateness of technology for individuals who may be vulnerable, such as people with symptoms of disinhibition or impaired judgement. Caution and monitoring of the person's use of the technology may be necessary in some cases.

## **Vocational Rehabilitation**

**A** - People with traumatic brain injury should be assessed for the need for vocational rehabilitation to assist their return to work, or for entering the workforce for those not previously employed, and vocational rehabilitation should be provided to those found to need it.

**A** - Standard vocational rehabilitation interventions such as cognitive training and behaviour modification should be monitored for effectiveness, and supported employment provided for those for whom the standard interventions are insufficiently effective.

**B** - Supported employment should include these fundamental aspects:

- Job placement, including:
  - Matching job needs to abilities and potential
  - Facilitating communication between the person, the employer and carers
  - Arranging travel/training
  - Proactive assessment of the job environment for potential problems by someone with expertise in this area
- Job site training and advocacy by the job coach including:
  - Training
  - Proactive identification of problems
  - Designing solutions in cooperation with the person with traumatic brain injury, carers and employers
  - Ongoing assessment with continuous monitoring of key aspects of the person's performance in work
- Job retention and follow-up by the job coach including:
  - Monitoring of progress to anticipate problems and intervene proactively when necessary

## **Sexuality**

**C** - The opportunity to discuss issues relating to sexuality should be offered early after significant traumatic brain injury, to both the person and their partner. This should be initiated by the health professionals.

**C** - Advice about sexuality should cover both physical aspects (e.g., positioning, sensory deficits, erectile dysfunction, drugs) and psychological aspects (e.g., communication, fears, altered roles and sense of attractiveness).

**C** - Families/Whānau and carers should be reassured that sexually inappropriate behaviour is not unusual in people who are in the early stages of recovery from a traumatic brain injury and that it should improve with time, and be provided with training in how to avoid inadvertently reinforcing the behaviour.

**C** - If the sexually inappropriate behaviour is severe, dangerous or persistent, it will need to be addressed as part of the rehabilitation programme for the person.

### **Leisure and Recreation**

**C** - Traumatic brain injury rehabilitation services should support people with clinically significant traumatic brain injury in developing alternative leisure and social activities, in liaison with local voluntary organisations.

**C** - Assessments of all people with traumatic brain injury should include the identification of:

- Their level of participation in leisure activities
- The barriers or compounding problems which inhibit their engagement in such activities

**C** - People with traumatic brain injury who have difficulty undertaking leisure activities of their choice should be offered a goal-directed, community-based programme aimed at increasing participation in leisure and social activities.

**C** - Carers should be given advice on how to maintain their own leisure and social activities while in a caring role.

### **Management of Persistent Symptoms and Activity Limitations Following Mild Traumatic Brain Injury**

#### **Prevention of Persistent Symptoms Following Mild Traumatic Brain Injury**

**B** - All people with possible or definite mild traumatic brain injury should receive information about common symptoms and reassurance that recovery over a short period of time (days to a few weeks) is highly likely.

#### **Assessment of People with Persistent Symptoms after Mild Traumatic Brain Injury**

**C** - A careful assessment of possible alternative causes of the symptoms post-mild traumatic brain injury should be made to ensure correct treatment, with referral to specialists if necessary.

**GPP** - If a person with a mild traumatic brain injury presents because they have symptoms which are causing concern late, or re-presents to health care services

after being discharged with information, an initial assessment should be performed and the person referred, if appropriate.

**GPP** - When a person, particularly a child, with mild traumatic brain injury has symptoms persisting beyond a month, a careful reassessment of possible severity should be made.

**GPP** - All people with persisting, clinically significant symptoms of traumatic brain injury after four to six weeks should be referred for a specialist assessment, usually including a neuropsychological assessment.

**GPP** - An appraisal of the severity and impact of symptoms of traumatic brain injury should be made, and:

- Minor problems should be managed symptomatically
- The person should be offered reassurance and information on symptom management strategies.

**GPP** - If there are more severe symptoms, or suspicion that the traumatic brain injury is not 'mild', the person should be referred for further assessment and rehabilitation, as appropriate.

## **Post-Discharge Follow-Up and Support for People with Traumatic Brain Injury**

### **Follow-Up**

**B** - Anyone with traumatic brain injury and a recorded Glasgow Coma Scale of 13 or less at any stage after the first 30 minutes OR who received a CT scan of the head as part of their initial assessment should be routinely followed up with, as a minimum, a written booklet about managing the effects of traumatic brain injury and a phone call in the first week after the injury. This follow-up needs to be undertaken by someone trained in identifying and managing common problems following traumatic brain injury.

**C** - Any person who has had a head injury and later seeks contact with primary care or an Emergency Department with symptoms of traumatic brain injury should be referred for assessment by a professional trained in assessment of the sequelae of brain injury.

**B** - Anyone with moderate or severe traumatic brain injury discharged from a residential rehabilitation setting should be considered for scheduled telephone follow-up contact using motivational and problem-solving techniques.

### **Continuing Care and Support**

**C** - The aim of long-term services should be to enable and sustain optimal societal participation for both the person with traumatic brain injury and their family/whānau and carer(s), while supporting personal choice and helping them to adjust to the new situation.

**C** - Information should be given in both written and verbal formats.

**C** - Written information should be concise and clear, use simple, easy-to-understand language and be illustrated with graphics, if appropriate.

**C** - People who have had a traumatic brain injury and their carers should receive information including:

- Symptoms and signs which may indicate what to do about them and the need for further investigation
- Reassurance about symptoms and signs which are not unexpected
- Advice about safety and self-care measures
- Advice on alcohol or drug misuse for people who initially presented with drug or alcohol intoxication
- Details of community resources
- Information for carers on the difficulties of an injury that cannot be detected by those who do not know about the injury

**C** - A letter or e-mail detailing the clinical history, examination and any imaging should be sent to the general practitioners of all people who have attended an Emergency Department with a head injury and been discharged. A copy of this letter should be given to the person or their carer(s).

**C** - All people with any degree of severity of head injury and their carers should be made aware of the possibility of long-term problems from a traumatic brain injury and of services they could contact should they experience long-term problems.

**C** - People who have had a traumatic brain injury and are being transferred to rehabilitation services should have a written management plan (of which they are given a copy) that details:

- Current needs
- Key contacts
- Responsible services/professionals
- Sources of continued information, support and advice

**C** - Management plans should be agreed jointly between the person, their carer(s) and health and social care professionals from the services involved in the transition **prior to transition** and a time-frame for review agreed.

**C** - Upon transfer or discharge, there should be a written discharge report which includes:

- The results of all recent assessments
- A summary of progress made and/or reasons for case closure
- Recommendations for future intervention

**C** - Copies of the management plan and the discharge report should be provided to the person and their family/whānau and carer(s), and to all professionals relevant to the person's current stage of rehabilitation.

**GPP** - Information about possible long-term effects should be given in a practical and reassuring manner, and efforts should be made to alleviate the concerns of people with traumatic brain injury and their carers.

### **Māori and Traumatic Brain Injury**

**C** - At the service level:

- Practitioners working with Māori with traumatic brain injury should receive training and support in culturally safe practice.

**C** - At the individual level:

- Rehabilitation of Māori with traumatic brain injury should include the diagnosis and management of traumatic brain injury-related syndromes, including mental illness and substance abuse.

**GPP** - Nationally:

- A national action plan aimed at improving outcomes for Māori with traumatic brain injury (TBI) should be developed.
- Accurate ethnicity data for TBI incidence should be collected.

**GPP** - At the service level

- Accurate ethnicity data for people with TBI managed by a service should be collected.
- Where possible, the case coordinator/key worker for Māori with TBI should be Māori, or where this is not possible, the case coordinator should have support from a Māori cultural advisor.
- Māori community health workers and other Māori health workers fluent in te reo Māori should be considered as part of the rehabilitation team for Māori with TBI.
- Neuropsychological and other assessment measures that have been standardised for Māori populations should be used, where possible.

**GPP** - At the individual level:

- Rehabilitation practitioners assessing Māori with TBI should consider the validity of the questions within neuropsychological and other assessment measures that have not been standardised for Māori.
- All decisions should be made in consultation with the individual with TBI, and if they wish, their whānau.
- Effective methods of delivery of quality information should be employed. Information should be provided in appropriate formats, both verbal and written.
- The whānau of the person with TBI should be supported during the rehabilitation process.

### **Pacific Peoples and Traumatic Brain Injury**

**C** - Socioeconomic circumstances, such as access to transport or a telephone, should be considered when planning traumatic brain injury rehabilitation.

**C** - Language interpreters should be offered regardless of perceived proficiency in English.

**C** - There should be a Pacific team or at least one Pacific health care practitioner available as part of the multidisciplinary rehabilitation team for Pacific peoples with traumatic brain injury.

**C** - A Pacific cultural advisor and/or matua should be available to traumatic brain injury rehabilitation staff for consultation.

**C** - All information should be produced in Pacific languages and in oral form (e.g., videos), where possible.

**C** - The need for culturally aesthetically appropriate physical surroundings and environments for Pacific peoples should be taken into account.

**C** - Caution should be used with assessment tools that have not been developed or standardized for Pacific peoples. Decisions regarding assessment, rehabilitation and coordination should be based on contextual information from a variety of sources and should include Pacific input.

**C** - Traumatic brain injury assessment and rehabilitation processes for Pacific peoples should be structured so that they involve family, extended family and an interpreter and/or matua, and include cultural protocols, where required.

**C** - Traumatic brain injury rehabilitation staff should be aware that there is much diversity between Pacific cultures, and that detailed concepts of rehabilitation will also vary between and within cultures.

**GPP** - Traumatic brain injury rehabilitation staff should be aware of traditional Pacific beliefs and the stigma surrounding illness and disability in order to minimise the potential for giving offence.

**GPP** - Services should be offered to Pacific peoples with traumatic brain injury, rather than expecting them to initiate contact and ask for it.

## **Children and Young People And Traumatic Brain Injury**

### **Transitions**

**C** - The management of transitions for children and young people with traumatic brain injury should include:

- Case coordination
- Planning for re-integration starting soon after the acute injury
- A full assessment of the needs of the young person with traumatic brain injury in an education environment

**GPP** - The management of transitions for children and young people with traumatic brain injury should include:

- Coordinated transition plans prepared with the family/whānau and carer(s), the child/young person with traumatic brain injury, educators, and rehabilitation specialists
- Information provided to schools about traumatic brain injury and possible long-term impairments
- The provision of updates and orientation to school peers
- Clear and effective communication
- The provision of training/education on an ongoing basis to all staff involved in the child's education
- Alternative options for learning
- Supplementary therapy services
- Planning for transition to adulthood with formal transition programmes
- Preparation for transitions including:
  - The student being prepared for new situations, environments, people and challenges
  - Staff who will be involved in the child's education being advised of their strengths, problems, needs and appropriate resources and strategies
  - Preparation of carers
- The adaptability and modification of the curriculum to meet the student's needs
- Monitoring during transitions for support for emergent needs

### **Provision of Rehabilitation**

**C** - Children with clinically significant traumatic brain injury should receive long-term continued monitoring and follow-up.

**C** - Teachers and other educational staff involved in the teaching and rehabilitation of children and young people with TBI should receive education tailored to the specific needs of the school and the particular characteristics of the child with traumatic brain injury about:

- Typical impairments in memory and learning
- Common problems with behavioural and emotional self-regulation
- The high risk of academic failure in children with moderate to severe traumatic brain injury
- Factors influencing the rate of recovery
- The ability of the rehabilitation team to help address learning problems as they arise

**C** - Parents and other carers of children and young people with TBI should be provided with training in direct intervention and advocacy skills, including how to recognise when to seek specialist help and advice.

**GPP** - The parents and carer(s) of a child with traumatic brain injury should be closely involved in the provision of information to educational staff working with the child.

**GPP** - All teachers, particularly special education staff and resource teachers for learning and behaviour should be routinely trained to recognise patterns of impairment resulting from traumatic brain injury and to seek specialist advice, where appropriate.

**GPP** - The need of siblings for support, assessment and education should be considered.

### **Needs of Carers**

**C** - Carers should be individually assessed when assuming the carer role and at regular intervals thereafter, including for:

- The care provided
- The need for support, including respite care
- The need for training
- Their stress and mental health issues

**B** - Support should be provided for carers, including:

- Information
- Professional and social support
- Emotional support, including family therapy and relationship/marital counselling, as required

**C** - A guide to traumatic brain injury rehabilitation services and resources should be provided to carers.

**GPP** - A holistic view should be taken of the person with traumatic brain injury and their carer(s) within the context of their wider family/whānau and social networks.

**GPP** - Health care practitioners working with people with traumatic brain injury should be aware of who the primary carers are, including both paid, formal carers and unpaid, informal carers who are usually family/whānau members.

**GPP** - Family members, including carers, of people with traumatic brain injury should be able to maintain their previous social roles as far as possible and it should not be assumed that family members will automatically accept the carer role.

**GPP** - Moderating factors of the ability to cope should be used to inform decisions about the interventions to provide for carers of people with traumatic brain injury.

**GPP** - Additional support should be provided for carers, including:

- Crisis support
- Training and education for the carer role
- Training in behavioural management techniques when the person with traumatic brain injury has behavioural and personality changes resulting from the traumatic brain injury



- Respite care

## **Parents/Carers of Children and Young People with Traumatic Brain Injury**

**C** - Families/Whānau of children with traumatic brain injury need provision of support aimed at enhancing the following:

- Social support
- Family relationships and functioning
- Stress management
- Help with adjusting to the new situation

**C** - There should be an assessment of the individual needs of the family, and interventions individualised to the family's needs and comprising some or all of the following should be provided as needed:

- Education and information
- Coping strategies, including problem-solving
- Specialist marital counselling
- Specialist family therapy
- Specialist psychotherapy for the primary carer(s)
- Support for building and maintaining social support networks
- The development of sources of emotional support
- Financial advice and support

**GPP** - Formal support programmes should be developed and provided for the families/whānau, carers and siblings of children with traumatic brain injury.

## **Special Issues**

### **Capacity and Consent**

**C** - Health care practitioners should make every effort to ascertain injured people's wishes with regard to each individual intervention, and where this cannot be determined, to discover what their attitude to treatment might have been but for the traumatic brain injury.

**C** - A clinical neuropsychologist and/or a speech-language therapist should be consulted with regard to assessing an individual's cognitive abilities or enhancing communication.

**C** - Where a person lacks, or may lack, capacity, and treatment is considered which appears to be against their wishes, the advice of a psychiatrist should be sought with regard to determining capacity and any possible application of the Mental Health Act 1992.

**GPP** - Family and carers, particularly the next of kin, should be consulted about the likely wishes of the individual in light of their premorbid values and beliefs.

**GPP** - Specialist assistance from a neuropsychologist or neuropsychiatrist should be sought to maximise the capacity of the person to consent to treatment.

**GPP** - When the person with traumatic brain injury is Māori, a Māori facilitator should also be involved in the process of gaining consent.

## **Driving**

**GPP** - The rehabilitation team should:

- Inform the person and their family/whānau and carer(s) about the law and driving after brain injury
- Provide clear guidance for the general practitioner and family, as well as the person, about any concerns about driving

**GPP** - Land Transport New Zealand should undertake discussions with relevant agencies to formulate new recommendations regarding people driving following a traumatic brain injury.

## **Drug and Alcohol Use and Misuse**

**C** - Any comorbid issues should be identified and addressed in people with traumatic brain injury and drug and alcohol problems.

**C** - Family/Whānau members and other carers need to be educated on how to identify high-risk situations, and how to identify and respond to warning signs and relapses relating to drug and alcohol misuse in people with traumatic brain injury.

**GPP** - People with traumatic brain injury should be advised that the effects of psychoactive drugs and alcohol may be increased, and that they should abstain from use for twice as long as the time taken for all symptoms to resolve.

**GPP** - Rehabilitation professionals should refer people with traumatic brain injury and substance misuse problems to specialist drug and alcohol services.

**GPP** - Families/Whānau should be involved early to aid in determining drug and alcohol issues in people with traumatic brain injury.

**GPP** - Management strategies for drug and alcohol issues in people with traumatic brain injury should be developed in collaboration with specialist traumatic brain injury staff. Formal systems of collaboration between specialist traumatic brain injury staff and drug and alcohol service staff should be developed.

**GPP** - Drug and alcohol service staff working with people with traumatic brain injury should receive training in traumatic brain injury sequelae and their effects on drug and alcohol use.

## **Mental Health in Adults with Traumatic Brain Injury**

**C** - If a person with TBI has significant neuropsychiatric problems, local mental health teams should be involved in the development of a management plan, including inpatient management, discharge management and follow-up.

**C** - Specialist neuropsychiatry support should be available to local mental health teams in the management of people with complex neuropsychiatric problems following TBI.

**C** - If a person with traumatic brain injury is unwilling to stay in hospital yet needs to do so because it would not be safe for them to go home, consideration should be given to the need for treatment under the Mental Health Act 1992.

**C** - Staff should be aware of their duty of care to ensure the safety of people who are putting themselves or others at risk, including ensuring carer safety and immediately accessible assistance and support.

**C** - Services for people with traumatic brain injury, including:

- Local acute care and rehabilitation services contracted to manage people with traumatic brain injury
- Local mental health services
- ACC personnel

should collaboratively specify and document policies for dealing with people with traumatic brain injury who have mental health issues, whether they pre-date or follow the traumatic brain injury.

**C** - Where traumatic brain injury is a result of deliberate self-injury, or where people with traumatic brain injury exhibit suicidality, they should have a psychiatric assessment including a risk assessment and consideration of the need for further intervention from the mental health team.

**GPP** - Staff of mental health services should receive training in recognition of the particular issues they may encounter in people with traumatic brain injury.

#### *Diagnosis and Management of Mental Health Disorders Post-Traumatic Brain Injury*

##### Diagnosis of Post-Traumatic Brain Injury Depression

**GPP** - The main issues to be considered are:

- Whether the depression is severe enough to affect health or impede recovery
- Whether the depression is likely to respond better to antidepressant medication or other interventions
- Whether the antidepressant medication for the individual is safe and acceptable
- How to monitor the effectiveness of treatment
- How long to continue treatment

**GPP** - Using an appropriate depression screening tool, for adults or children, should be a part of routine practice.

**GPP** - Depression screening tools should not be used as the sole indication for initiation of treatment. Diagnosis should always involve clinical judgement by a specialist experienced in managing people with TBI.

**GPP** - The person with TBI should be referred to a psychiatrist with expertise in treating people with TBI if:

- The risk of suicide is judged significant
- The initial treatment is not effective within two months
- The presentation is complex
- Pharmacotherapy is indicated and the familiar medication strategies are contraindicated

### *Interventions for Mental Health Disorders in People with Traumatic Brain Injury*

#### Diagnosis and Management of Post-Traumatic Stress Disorder for People with Traumatic Brain Injury

**GPP** - Assessment for differential diagnosis should consider the overlap in symptoms between mild traumatic brain injury and post-traumatic stress disorder. If there is doubt, the person should be referred for a specialist neuropsychological assessment.

#### Diagnosis and Management of Post-Traumatic Brain Injury Psychosis

**GPP** - People who have possible psychotic symptoms post-traumatic brain injury should be referred to a psychiatrist with expertise and experience in the management of people with traumatic brain injury.

#### Pharmacotherapy

**C** - There should be careful consideration of the sensitivity of people with traumatic brain injury to psychotropic medication before trial use. The use of psychotropic medication should be avoided where possible, and used with caution where indicated.

**GPP** - In any trial of psychotropic medication, the 'start low and go slow' approach should be adopted.

**GPP** - Medications that have an adverse effect on central nervous system functioning, particularly antipsychotics such as barbiturates, benzodiazepines, phenytoin and haloperidol, should be avoided.

**GPP** - Serum drug levels should be monitored as necessary.

**GPP** - The risks, benefits and harms should be discussed with the injured person and their carer(s), and it should be explained that response to medication after traumatic brain injury is less predictable than in standard practice.

#### Pharmacotherapy for Post-traumatic Brain Injury Depression

**C** - A specific selective serotonin reuptake inhibitor should be the first choice for treatment of post-traumatic brain injury depression unless the anticholinergic effects of a tricyclic are considered desirable.

**C** -The person with traumatic brain injury should be kept under direct clinical monitoring while the drug dose is increased to an effective dose to ensure that the drug is tolerated and producing the required improvement in mood.

**C** -People with traumatic brain injury should be asked about any over-the-counter remedies, herbs or supplements they are taking to check for potential interactions and adverse effects.

**GPP** - If selective serotonin reuptake inhibitors have been trialled and are not effective, or have produced unwanted side effects or drug interactions, the person should be referred for review to a psychiatrist with expertise in treating people with traumatic brain injury.

#### Psychotherapeutic Approaches

**C** -Cognitive-behaviour therapy tailored for any cognitive impairment should be used for people with post-traumatic brain injury, depression and anxiety.

**GPP** - Cognitive-behaviour therapy should be adapted and administered for people with traumatic brain injury by clinical psychologists familiar with traumatic brain injury as well as cognitive behaviour therapy.

**GPP** - Simple problem-solving measures should be used to address factors contributing to low mood or anxiety.

#### **Repeated Traumatic Brain Injury and Traumatic Brain Injury in Sports**

##### *Immediate Management of and Return to Play after Sporting Injuries*

**C** - If there is any one of the following, traumatic brain injury should be suspected and appropriate management instituted:

- Loss of/impaired consciousness
- Any seizure
- Amnesia:
  - Unaware of period, opposition, score of game
  - Unaware of time, date, place
- Headache
- Nausea/vomiting
- Unsteadiness/loss of balance and/or poor coordination
- Dizziness
- Feeling stunned or 'dazed'
- Seeing stars or flashing lights
- Ringing in the ears
- Double vision
- Vacant stare/glassy eyed
- Slurred speech

- Inappropriate playing behaviour – for example, running in the wrong direction
- Appreciably decreased playing ability
- Confusion, such as being slow to answer questions or follow directions
- Easily distracted, poor concentration
- Other symptoms, such as sleepiness, sleep disturbance and a subjective feeling of slowness and fatigue in the setting of an impact
- Displaying unusual or inappropriate emotions, such as laughing or crying
- Personality changes

**C** - When a player shows **any** symptoms or signs of a concussion:

- The player should not be allowed to return to play in the current game or practice
- The player should not be left alone and should be regularly monitored for deterioration
- The player should be medically evaluated after the injury
- Return to play must follow a medically supervised stepwise process
- A player should never return to play while symptomatic

**C** - Return to play after a concussion should follow a stepwise process, proceeding to the next level only if asymptomatic. If any symptoms occur after concussion, the person should revert to the previous asymptomatic level and try to progress again after 24 hours.

1. No activity. When asymptomatic, proceed to level 2.
2. Light aerobic exercise.
3. Sport-specific training.
4. Non-contact training drills.
5. Full contact training **after medical clearance**.
6. Game play

### *Repeated Traumatic Brain Injury in Children*

**GPP** - Children and adolescents should not resume sports or training until all of the physical symptoms of concussion have fully resolved, following the 'return-to-play' guide.

**GPP** - Return to school should be carefully managed following concussion, with the child monitored for recurring or emergent symptoms.

### **Violence and Traumatic Brain Injury**

**C** - All personnel involved in the triage and assessment of people with head injuries/traumatic brain injury should have training in the detection of violence and non-accidental injury.

### **Definitions:**

### **Levels of Evidence**

+ strong study where all or most of the validity criteria are met

~ fair study where not all the validity criteria are met, but the results of the study are not likely to be influenced by bias

x weak study where very few of the validity criteria are met and there is a high risk of bias.

### **Grades of Recommendations**

**A** - The recommendation is supported by good evidence (where there are a number of studies that are valid, consistent, applicable and clinically relevant).

**B** - The recommendation is supported by fair evidence (based on studies that are valid, but there are some concerns about the volume, consistency, applicability and clinical relevance of the evidence that may cause some uncertainty but are not likely to be overturned by other evidence).

**C** - The recommendation is supported by international expert opinion.

**GPP** - Where no evidence is available, best practice recommendations are made based on the experience of the Guideline Development Team, or feedback from consultation within New Zealand.

### **CLINICAL ALGORITHM(S)**

Clinical algorithms are provided in the original guideline document for:

- Diagnostic management and selection for imaging of children and young people aged <17 years
- Assessment of depression in traumatic brain injury
- Safe steps to return to play after a possible traumatic brain injury
- 'Stages of rehabilitation' model for people with traumatic brain injury

## **EVIDENCE SUPPORTING THE RECOMMENDATIONS**

### **TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS**

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations").

## **BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS**

### **POTENTIAL BENEFITS**

Appropriate diagnosis, acute management, and rehabilitation with patients with traumatic brain injury, resulting in reduced morbidity or mortality, increased rate of return to employment/school, improved level of functioning, and improved quality of life

### **POTENTIAL HARMS**

- Side effects of therapy. The original guideline document refers readers to MedSafe data at [www.medsafe.govt.nz](http://www.medsafe.govt.nz) for side effects of:
  - Botulinum toxin A BTX-A
  - Intrathecal baclofen
  - Tizanidine
  - Amantadine
  - Bromocriptine
  - Methylphenidate and amphetamines
  - Donepezil hydrochloride and other cholinergic agents
- People with traumatic brain injury (TBI) may be more sensitive (i.e., have a 'low threshold') to the effects (positive and negative) of medications. Any trial of medication for people with TBI should be commenced at low doses, with careful monitoring for both effectiveness and adverse side effects, and cautious increases in dosage. There also needs to be a clear explanation to the person with TBI and their carer(s) with a caution that effects of medications are less predictable in people with TBI.

## CONTRAINDICATIONS

### CONTRAINDICATIONS

The original guideline document refers readers to MedSafe data at [www.medsafe.govt.nz](http://www.medsafe.govt.nz) for contraindications for:

- Botulinum toxin A (BTX-A)
- Intrathecal baclofen
- Tizanidine
- Amantadine
- Bromocriptine
- Methylphenidate and amphetamines
- Donepezil hydrochloride and other cholinergic agents

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

- Evidence-based best practice guidelines are produced to help health practitioners and consumers make decisions about health care in specific clinical circumstances. Research has shown that if properly developed, communicated and implemented, guidelines can improve care. The advice in this guideline is based on epidemiological studies and other research evidence. Where no evidence is available, but guidance is needed, recommendations for best practice are developed through a systematic consensus process based on the experience of the Guideline Development Team.
- This guideline is not a service framework and does not extend to a detailed analysis of the most effective service configurations to support the recommended assessment and rehabilitation strategies. The section on implementation is similarly intended as a broad conceptual guide. This edition does not specifically address the needs of all minority populations within New Zealand, although they may be considered in future reviews.



## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

#### Implementation

This Traumatic Brain Injury (TBI) guideline can be implemented on four levels:

1. Increasing knowledge, making practitioners aware of the guideline (education influence)
2. Changing attitudes, such that practitioners agree with and accept recommendations as a better standard of care (personal factors)
3. Changing behaviour, such that practitioners change their clinical practice to conform with the guideline
4. Changing outcomes by improving health and quality of care for consumers

There is an imperfect evidence base to support decisions about which guideline dissemination and implementation strategies are likely to be efficient under different circumstances. The principal findings of a 2004 systematic review show that the following approaches have had some effect:

- Dissemination of the guideline information
- Reminders of the most effective treatments
- Educational outreach
- Educational material, audit and feedback

#### Implementation Activities

##### *Increasing Knowledge*

##### Dissemination

- The full guideline and supporting documents will be published.
- Electronic formats of the guideline and supporting documents, such as pro forma discharge letters, would be useful as they can be easily downloaded and utilised.
- Summaries of the guideline should be developed for specific groups.
- Guideline recommendations could be summarised in relevant publications.
- Consumer information that is developed might be offered in Pacific languages in written and oral forms (e.g., tapes and videos).
- The guideline will be presented at relevant conferences by members of the Guideline Development Team and other experts.
- General practitioner peer review groups offer an ideal forum for the introduction and discussion of the guideline. Local Guideline Development Team members could be involved in these meetings.

##### *Targeted Resources*

In order to facilitate the dissemination of information to the appropriate groups and individuals, tailored information about the TBI guideline recommendations could be developed for a variety of audiences, including:

- The health care practitioners who first assess and treat people with TBI (particularly accident and emergency service personnel and primary care practitioners)
- Rehabilitation service personnel
- Those working with children and young people in settings such as paediatric wards, children's rehabilitation facilities and Emergency Departments
- Consumers and their families, whānau and carers

### *Changing Attitudes*

Accident Compensation Corporation (ACC), District Health Boards (DHBs) and related agencies should initiate discussions to consider:

- How TBI services should be structured (i.e., centralised TBI specialist unit(s) versus distributed services)
- How to meet the recommendations for the skill set within multidisciplinary assessment teams for people with TBI
- A plan for maximising the coordination of trauma services
- How to develop an alerting call system, with appropriate protocols
- How to develop family/local supports and coordination for people with TBI
- How to develop a Māori TBI action plan
- How to develop the case coordinator/key worker role
- How to set up and collect evaluation data
- How to set up and collect the recommended performance indicators
- How to develop educational outreach programmes aimed at reinforcing the main guideline messages to a variety of audiences such as general practitioners, emergency services, rehabilitation providers and DHBs
- How to encourage collaboration between education services, ACC, DHB mental health services, disability support services, Work and Income New Zealand, housing services and other organisations to assess whether services provided by these agencies meet the guideline recommendations

ACC could also discuss the driving rules for people who have had a brain injury with Land Transport New Zealand.

### *Changing Behaviour*

#### Collaboration

At a local level, regional ACC offices and local DHBs could:

- Review the ways local acute care and rehabilitation services contracted to manage people with TBI, plus local mental health services, work together to specify and document policies for dealing with people with TBI who have mental health issues (whether they pre-date or follow the TBI)
- Initiate collaboration between agencies (e.g., adult education schemes, employment schemes, charities) to obtain adapted hard- and software and training to enable people with TBI to develop appropriate computer skills.

#### Services for Māori

ACC and DHBs should consider developing a TBI action plan for Māori that will address ways of:

- Increasing the Māori health care workforce in TBI through recruitment and retention programmes
- Liaising with local Māori providers. Scholarships and other support could be developed to encourage the Maori health care workforce into the TBI field
- Seeking input from local Māori providers, tangata or mana whenua to assist with service delivery for Māori with TBI

#### Services for Children and Young People

- ACC could consider the development of the case coordinator/key worker role.
- An action plan for the management of TBI rehabilitation for children and young people should be developed.

#### Carers

Appropriate agencies should implement processes for:

- The assessment of carers' needs
- The allocation of respite care
- The assessment of support needs of carers of those with TBI (including financial support)

#### Access to Services

As a result of the Current Practice Review and discussions on the guideline, it appears that there is a need to ensure that people who have had a TBI are able, when appropriate, to access the following services easily:

- Specialist rehabilitation units for:
  - Children and young people
  - Adults
- Imaging services, particularly in rural areas
- Specialist clinics for managing persistent symptoms
- Training for carers
- Age-appropriate residential support

#### *Changing Outcomes*

Model discharge letters, posters for Emergency Departments and other tools should be developed to provide ongoing reminders for staff of the guideline's best practice recommendations.

In order to assess whether the guideline has been operationalised throughout New Zealand and whether there have been corresponding improvements in care and outcomes for people with TBI, evaluation of the implementation activities should be undertaken. This evaluation should occur before the guideline is due to be revised.

Evaluation at the programme level depends on a number of factors, including funder requirements, provider goals and service structure. There are several key questions for a programme-level evaluation:

1. Are the overall results of the programme consistent with the expectations of:
  - The service's consumers (individuals, families/whānau and carers)?
  - The providers?
  - The funders?
2. Was the programme carried out as specified in the guideline?
3. How do the results of this programme compare with those of similar programmes (or similar clients in a different type of programme) both locally and overseas?
4. Do the results justify the costs (for consumers, providers, funders)?
5. Can we improve our service to better meet the needs of consumers and funders? How?
6. Can we improve the efficiency with which we provide the service without compromising results?
7. What is the service's case-mix?
8. What are the benefits or limitations of the programme for enhancing interdependence?

Some programmes may have poor evaluation results because people with severe TBI generally have poorer outcomes than other individuals, whatever the rehabilitation. So the outcomes of a programme with a relatively large percentage of people with severe TBI are likely to be generally poorer than those for a programme dealing mainly with individuals with mild or moderate TBI, independent of programme content or quality.

There are some additional questions to be considered:

- How does the service measure resource use? This will vary with the type of service (e.g., length of stay, hours of contact time, numbers of visits in the community).
- How does the service measure consumer and funder satisfaction?
- How does the service measure programme implementation?
- How does the service control outcome measures for factors that affect outcomes (e.g., premorbid status, drug abuse, other medical/surgical or psychiatric conditions, family/whānau circumstances)? As a minimum, this information needs to be collected (see guidelines for *Assessment of people with persistent symptoms after mild traumatic brain injury* in the "Major Recommendations" field), although it is acknowledged that gathering such information can be difficult.

## **Performance Indicators**

Owing to the complexity and scope of the guideline, a comprehensive set of performance indicators for this guideline could be developed at a later date.

In the interim, the NICE guideline has identified the following performance indicators relating to the criteria used to order imaging of the head.

To audit adherence to these NICE criteria, prospective data collection on all people with suspected TBI assessed in Emergency Departments should be undertaken. For each of these people, data on a variety of risk factors should be collected. The following broad categories of risk factor should be addressed:

- Loss of consciousness since injury
- Glasgow Coma Scale scores since injury
- Age
- Mechanism of injury
- Signs of open or depressed skull fracture
- Signs of basal skull fracture
- Results of imaging
- Post traumatic seizure
- Focal neurological deficit
- Vomiting
- Amnesia (retrograde and anterograde)
- Coagulopathy
- Headache
- Drug or alcohol intoxication
- Irritability or altered behaviour
- Paraesthesia in the extremities
- Neck pain or tenderness

Collecting this data will highlight areas where people seem to be receiving imaging for inappropriate criteria, or conversely are not being imaged despite meeting the criteria laid out in this guideline.

## **IMPLEMENTATION TOOLS**

Audit Criteria/Indicators  
Clinical Algorithm

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## **INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES**

### **IOM CARE NEED**

Getting Better  
Living with Illness

### **IOM DOMAIN**

Effectiveness  
Patient-centeredness  
Timeliness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

New Zealand Guidelines Group (NZGG). Traumatic brain injury: diagnosis, acute management and rehabilitation. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2006 Jul. 240 p. [380 references]

### ADAPTATION

The guideline was adapted from the following source:

National Collaborating Centre for Acute Care. Head injury: triage, assessment, investigation and early management of head injury in infants, children and adults. London (UK): National Institute for Clinical Excellence (NICE); 2003 Jun 248 p. [373 references].

### DATE RELEASED

2006 Jul

### GUIDELINE DEVELOPER(S)

New Zealand Guidelines Group - Private Nonprofit Organization

### SOURCE(S) OF FUNDING

Accident Compensation Corporation

### GUIDELINE COMMITTEE

TBI Rehabilitation Guideline Development Team

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*NZGG Team:* Rowena Cave, Senior Project Manager, until September 2005; Rob Cook, Medical Advisor; Naomi Brewer, Researcher, until September 2004; Rose Matthews, Researcher, until April 2005; Mark Ayson, Researcher, from October 2005

## **FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST**

Michael Ardagh is a member of the Christchurch Brain Research Group, which received funding for post-head injury assessment. He is also a member of the Emergency Care Research Foundation, a charitable trust which supports emergency care research.

Harry McNaughton has received funding for research and fees for consulting from the Accident Compensation Corporation (ACC).

Kate Hall received funding to attend the Epilepsy Symposium 2002 from Janssen-Cilag.

Elizabeth Rowland is a director of a private limited company providing occupational therapy services.

## **GUIDELINE STATUS**

This is the current release of the guideline.

## **GUIDELINE AVAILABILITY**

Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).

Print copies: Available from the New Zealand Guidelines Group Inc., Level 10, 40 Mercer Street, PO Box 10-665, The Terrace, Wellington, New Zealand; Tel: 64 4 471 4180; Fax: 64 4 471 4185; e-mail: [info@nzgg.org.nz](mailto:info@nzgg.org.nz).

## **AVAILABILITY OF COMPANION DOCUMENTS**

The following are available:

- TBI tools review & supplementary report. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2005 Apr. 144 p. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- Traumatic brain injury rehabilitation in New Zealand: current practice review. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2004 Nov. 96 p. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- The diagnosis, acute management and rehabilitation of people after traumatic brain injury. Search strategies. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2006. 18 p. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- The diagnosis, acute management and rehabilitation of people after traumatic brain injury. Evidence tables. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2006. 210 p. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- ACC provider development unit. Traumatic brain injury: managing persistent symptoms after a mild traumatic brain injury (TBI). ACC Review Issue: 31. 2006 Sep. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- ACC Provider Development Unit. Traumatic brain injury: rehabilitation issues in mild TBI. ACC Review Issue: 32. Nov 2006. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).
- The diagnosis, acute management and rehabilitation of people after traumatic brain injury. Appendix D: medical radiation. Wellington (NZ): New Zealand Guidelines Group (NZGG); 2006. Electronic copies: Available in Portable Document Format (PDF) from the [New Zealand Guidelines Group Web site](#).

## **PATIENT RESOURCES**

None available

## **NGC STATUS**

This NGC summary was completed by ECRI on February 13, 2007. The information was verified by the guideline developer on April 12, 2007. This



summary was updated by ECRI Institute on November 9, 2007, following the U.S. Food and Drug Administration advisory on Antidepressant drugs.

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